Claims

What is Claimed is:

1. A method for plasma etching in an etch chamber with improved etching selectivity for a nitride containing material comprising the steps of:

providing a substrate having a low dielectric constant material including at least one overlayer of a nitride containing material on top;

depositing a photoresist layer overlying the at least one least one overlayer of a nitride containing material;

patterning said photoresist layer photolithographically for an etching process;

providing an ambient in said etch chamber conducive to forming a plasma including at least nitrogen and at least one compound selected from the group consisting of fluorocarbons and hydrofluorocarbons;

forming a plasma in said etch chamber in the presence of microwave power; and

adding oxygen and adjusting a nitrogen to oxygen ratio in said etch chamber whereby the at least one overlayer of a nitride containing material is preferentially etched through to a thickness to form an opening.

2. The method of claim 1, wherein the nitrogen to oxygen ratio is at least about 5.

3. The method of claim 1, wherein the at least one overlayer of a nitride containing material comprises a dielectric anti-reflective coating (DARC) layer.

4. The method of claim 3, wherein the at least one overlayer of a nitride containing material is selected from the group consisting of silicon nitride, silicon oxynitride, and titanium nitride.

5. The method of claim 1 further comprising the step of depositing a polymer layer comprising CN on at least a sidewall of said opening for etching a bottom portion of said opening.

6. The method of claim 1, wherein the ambient chamber further comprises hydrogen.

7. The method of claim 1, wherein a critical dimension bias is adjusted by altering a concentration of oxygen in the ambient.

8. The method of claim 1, further comprising:

flowing nitrogen into said etch chamber at a flow rate from about 50 to about 300 sccm;

flowing oxygen into said etch chamber at a flow rate from about 2 to about 10 sccm;

flowing into said etch chamber at least one of a fluorocarbon and hydrofluorocarbon into said etch chamber at a flow rate from about 20 to about 100 sccm; and

maintaining the ambient pressure in said etch chamber from about 40 to about 100 millitorr.

9. The method of claim 1, wherein the microwave power is supplied at a power level of from about 1000 to about 1500 Watts.

10. A method for plasma etching with improved etching selectivity for a dielectric material layer in an etch chamber comprising the steps of:

providing a substrate having a dielectric material layer overlying a nitride containing underlayer formed on top;

providing a photoresist layer overlying the dielectric material layer;

defining a pattern in the photoresist layer such that a portion of the dielectric material layer is exposed for etching according to a photolithographic process;

providing an ambient in said etch chamber conducive to forming a plasma including at least nitrogen and at least one compound selected from the group consisting of fluorocarbons and hydrofluorocarbons;

forming a plasma in said etch chamber in the presence of microwave power; and

adjusting a fluorine to carbon ratio whereby the dielectric material layer is preferentially etched through to a thickness of said dielectric material layer.

11. The method of claim 10, further comprising the step of adjusting the fluorine to carbon ratio within a range of about 2 to about 3.

12. The method of claim 10, wherein the dielectric material layer comprises a carbon containing material.

13. The method of claim 12, wherein the dielectric material layer has a dielectric constant of at most about 3.0.

14. The method of claim 10, further comprising the step of adjusting a nitrogen to oxygen ratio to at least about 5.

15. The method of claim 10, further comprising the step of adding an amount of oxygen such that the amount of oxygen represents about a lower limit at which a critical dimension adjustment in said photoresist layer can be effected.

16. The method of claim 14, further comprising the step of adjusting the nitrogen to oxygen ratio to at least about 10.

17. The method of claim 10, wherein the ambient in said etch chamber has a pressure from about 40 to about 60 millitorr.

18. The method of claim 10, wherein the microwave power is supplied at a power level of from about 1000 to about 1800 Watts.

19. The method of claim 10, further comprising the steps of:

flowing nitrogen into said etch chamber at a flow rate from about 150 to about 300 sccm;

flowing oxygen into said etch chamber at a flow rate from about 2 to about 10 sccm; and

flowing at least one of a fluorocarbon and a hydrofluorocarbon into said etch chamber at a flow rate from about 5 to about 15 sccm.

20. The method of claim 10, further comprising the step of providing a substantially oxygen free ambient in said etch chamber prior to etching through the dielectric material layer into the nitride containing underlayer.